

PLANT EXPLORATION IN RALAM VALLEY, KUMAON, HIMALAYAS¹

P. C. PANT AND B. D. NAIETHANI²

Observations on the vegetation of Ralam Valley and Ralam glacier, in the vicinity of Tibetan border with enumeration and short notes of 145 species from collections upto an altitude of 4800 m in eastern Kumaon are recorded.

INTRODUCTION

A sound policy on resources development and environmental management in the Himalayan region has become very necessary. The role of Himalayan forests in controlling soil erosion and silting of rivers, streams and irrigation canals down in the plains is well known. Therefore up-to-date data on plant life of the whole of the Himalayan region is of utmost importance. Keeping in view, this aspect the findings of a botanical exploration to Ralam Valley are being presented here.

Topography : Ralam valley is in Malla Johar region of Pithoragarh district in the interior of Eastern Kumaon, Himalayas stretching in a system of mountains with gorges, river valleys and glaciers in altitudinal range of 1200 m to 4800 m above mean sea level. Malla Johar extends from the Tibetan border down the Gori valley as far as its junction with the Ralam river. Almost all the villages of Malla Johar lie within the narrow gorge of Gori river. Milam is the northernmost village, Laspa is further south and to the east of Laspa is Ralam, a side valley through which flows the Ralam river. Malla Johar is a snow covered mountainous and glacial range. The rising chain of peaks separates Johar from Darma which culminates in Panchachuli. The horizon to the south-west is dominated by the superb mass of

Nanda Devi and Nandakot. Inhabitants of the valley move down to their winter season abode or encampments during colder months due to the heavy snow fall in the region.

Ralam valley can be approached by crossing the Gori river either at Lilam and trekking through Bui Pato-Saba Odiyar or by crossing Gori river near Burphu and trekking through Tola-Sumdu-Bazarganga. The former route is short but very difficult. The entry to the Ralam valley through the latter route is comparatively easier and this was followed during the year 1969 when we explored in Ralam valley under the auspices of Botanical Survey of India, Northern Circle, Dehra Dun. The collections cited in this paper are deposited in the herbarium of Botanical Survey of India, Dehra Dun (BSD).

Geology : Malla Johar contains Permian and Mesozoic rocks of the Tethys Himalaya lying in the region of Kiogor and Chitichun on the Tibetan frontier of Kumaon, embedded with huge masses of sediments consisting mostly of limestones of varying sizes from ordinary boulders to blocks of the dimensions of an entire hill mass.

The foreign transported blocks on the Tibetan frontier of Kumaon are known as exotic blocks of Johar, these exotic blocks are pink, red and white limestones of all ages from Permian to the Cretaceous.

Climate and rainfall : Climate in Ralam valley is austere and very close to that of Tibet.

¹ Accepted September 1979.

² Botanical Survey of India, 3, Laxmi Road, Dehra Dun (U.P.).

More than 50% of the precipitation falls as snow in winter months and precipitation is less than 10". Air is excessively dry during day time when strong south wind prevails. Regarding temperature in western Himalayan region it is on record that for every 180 m rise, there is a variation of approximately 1°C.

Vegetation : Descending from Martoli and crossing Gori river, Burphu village (3000 m) is reached, which is an important halting place on the way to Ralam Valley. The vegetation around Burphu was scanty, where the dry mountain slopes support shrubby *Juniperus* spp. which are the principal source of fuel wood for the inhabitants of Burphu. The herbaceous components around Burphu consist of *Prunella vulgaris*, *Origanum vulgare*, *Euphrasia* spp., *Pedicularis* spp., *Swertia* sp., *Gentiana* sp., yellow flowered *Taraxacum* sp. and white flowered *Anaphalis* sp., *Axyris amaranthoides* and highly aromatic *Artemisia stricta* were very common on dry sandy soil and also as weeds of the cultivated level land of Burphu.

Trekking eastwards from Burphu towards Ralam Valley the narrow path leads to Tola, a small village consisting of some 4-5 houses at a distance of about 8 kms from Burphu. The section between Burphu-Tola, was somewhat dry with scanty vegetation. An interesting feature of this section was the shrubby association of *Rosa sericea*-*Ribes grossularia* in addition to other shrubby growth of *Cotoneaster* spp., *Berberis* sp. and *Juniperus communis* distributed in the region. Beyond Tola the vegetation was in herbal form which included *Taraxacum* sp., *Geranium* sp., *Senecio ligularia*, *Polygonum chinense*, *Stellaria* sp. and *Adenocaulon bicolor* on moist shady habitats and along streams. On mountain slopes and rock crevices *Micromeria biflora*, *Taraxacum* sp., *Plantago* sp. and *Stellaria* sp. were common up to Sumdu, another small village. A little distance after Sumdu the path ascends from

2900m to 5200 m over the vast and rich meadow of Bazarganga pass facing the important Himalayan peaks of Nandakot, Nandaghunti, Trisuli and the Haldar ranges.

The vast meadow of Bazarganga was covered with clumps of *Danthonia cachemyriana* and other herbaceous elements like *Gentiana venusta*, *Swertia cuneata*, *Plantago brachyphylla*, *Elsholtzia eriostachya*, *Rumex dentatus*, *Oxyria digyna*, *Taraxacum officinale*, *Senecio chrysanthemoides*, *Aster* sp., *Impatiens* sp. and *Sibaldia parviflora* in shades of blue, yellow and pink coloured flowers thus forming thick matting of the Bazarganga. At few exposed patches where snow has melted the pretty pinkish-white, flowered herb, *Arenaria glanduligera* was of rare occurrence in the region.

Among shrubs *Gaultheria trichophylla*, *Rhododendron campanulatum*, *R. anthopogon* and *Salix lindleyana* were common. Ascending further towards Bazarganga Pass the above pattern of herbaceous vegetation was replaced by another set of alpine herbs such as *Aconitum violaceum*, *Delphinium cashmirianum*, *Picrorhiza kurooa*, *Pedicularis rhinanthoides*, *P. porrecta*, *Aletris pauciflora*, *Saussurea graminiifolia*, *Polygonum affine*, *Goodyera fusca*, *Heracleum brunonis* and *Guldenstaedtia himalaica*. The stout rhizomatic herb *Rheum moorcroftiana* on mountain slopes was quite rare in the area.

Of the tree vegetation, *Betula utilis* formed a community with *Rhododendron campanulatum* till reaching the snow line, thence crossing the Bazarganga Pass 4800 m and trekking through the kneedeep, snow clad valley, some of the typical alpine herbs met within the terrain were *Saussurea obvallata*, *S. taraxicifolia*, *S. kunthiana*, *Jurinea macrocephala*, *Parnassia lax-amannii*, *Orchis latifolia* and *Macrotomia benthamii* etc.

Proceeding towards Ralam village, an interesting vegetational feature of the area consists of a community of *Jurinea macrocephala*—

Anaphalis sp. intermixed with elements like *Morina coulteriana*, *Potentilla argrophylla*, *Codonopsis ovata*, *Delphinium* sp., *Polygonum* spp. and *Allium stracheyi* amidst clumps of *Danthonia cachemyriana*.

Ralam village situated at 4000 m consists of about 30 houses. Inhabitants of Ralam are known as 'Ralamwals' in the region. The land at Ralam is quite fertile, where *Fagopyrum tataricum*, *Eleusine coracana*, *Lepidium sativum*, *Brassica tournefortii* and very tasty high altitude variety of *Solanum tuberosum* were the main items of cultivation of the 'Ralamwals'.

Elsholtzia densa, *Capsella bursa—pastoris* and *Carduus onopordioides* were observed as common weeds of the cultivated fields around Ralam village. Near some houses plants of *Saussurea lappa* 'Kuth' were also planted as it has a high repute in the indigenous system of medicine. *Nardostachys jatamansii*, *Orchis latifolia* and *Allium* spp. are exploited in large quantities by the villagers for selling down in the plains.

Sorbus aucuparia, *Rhododendron campanulatum*, *Juniperus communis* and *Betula utilis* constitute the shrubby and tree vegetation respectively around Ralam. Proceeding towards Ralam glacier at a distance of about 5 km from the village of Ralam, the following three types of herbaceous communities were recognised.

1. *Potentilla atosanguinea*—*Rumex nepalensis* sheltering *Capsella bursa-pasteris*, *Nepeta spicata* and *Astragalus* sp.
2. *Potentilla atosanguinea*—*Anaphalis* sp. with *Delphinium vestitum*, *Senecio chrysanthemoides* and *Arenaria* sp.
3. *Potentilla atosanguinea*—*Jurinea macrocephala* with *Nepeta spicata*, *Delphinium vestitum*, *Anaphalis* sp. and *Cotoneaster* sp.

The meadows on way to Ralam glacier consist of thick clumps of *Danthonia cachemyriana* in addition to *Phleum alpinum* and *Juncus himalensis*. The noteworthy herbs of these meadows were chiefly the members of Gentianaceae and Scrophulariaceae such as *Gentiana pedunculata*, *G. stipitata*, *Swertia cuneata*, *S. ciliata*, *Pedicularis mollis*, *P. brunoniana*, *P. hoffmeisteri* and *Euphrasia* spp. respectively. Other herbaceous associates were *Geranium pratense*, *Phlomis bracteosa*, *Impatiens gigantea*, *Cynanthus lobatus*, *C. linifolius*, *Codonopsis ovata*, *Allium wallichii*, *A. stracheyi*, *Nomocharis nana*, *Hypericum monanthemum*, *Galium aparine*, *Dubyaea hispida*, *Helinium grandiflorum*, *Lactuca violaefolia*, *Astragalus candolleanus* and *Trigonella emodi*.

Of the shrubby growth *Berberis jaschkeana*, *Juniperus communis* and *Cotoneaster* sp. were of stray occurrence in the area.

In glacial moraine the herbaceous species were *Pedicularis brunoniana*, *Senecio chrysanthemoides*, *S. kunthianus*, *Dubyaea hispida*, *Anaphalis cuneifolia*, *Origanum vulgare* and *Nepeta spicata*. Amidst rocky boulders *Christolea himalayensis* with pinkish white flowers was an interesting crucifer of rare occurrence in the glacial region.

The last part explored was a particularly tough terrain, more so during the rainy season, between Ralam and Saba Odiyar having pockets of forests and long stretches of meadows. The forests were dominated by trees of *Rhododendron arboreum*, *Syringa emodi*, *Aesculus indica*, *Hippophae salicifolia*, *Acer* sp. and with shrubs of *Rhododendron lepidotum*, *Arundinaria spathiflora*, *Ribes* sp. and *Rosa* sp.

Undergrowth on meadows was comprised of herbaceous elements of Asteraceae, Gentianaceae and Scrophulariaceae members, a striking element in this section during the season was the tall Liliaceous herb—*Lilium giganteum*, with fragrant white flowers, the hollow stem of which is used by village-folk for making flutes,

Circaester agrestis near Saba Odiyar under rock crevices, *Utricularia kumaonense* amidst moss carpet from the environs of Pilti bridge and *Christolea himalayensis* from the glacial region are some of the interesting collections of the present visit to Ralam valley.

ENUMERATION OF PLANTS

GYMNOSPERMS

CUPRESSACEAE

1. *Juniperus communis* L.

Stunted woody shrub on rocky habitats, fruiting. On way to Tola 3000 m, common, 39649.

2. *J. wallichiana* Hook.f. et Thom. ex Parl

Large erect woody shrub on rocks and meadows with male cones. On way to Tola 3500 m, common, 39647.

DICOTYLEDONS

RANUNCULACEAE

3. *Aconitum deinorrhizum* Holmes ex Stapf

Tall erect herb with sky blue flowers, in *Betula-Rhododendron* forest. On way to Saba Odiyar 2500 m, rare, 39760.

4. *A. violaceum* Jacq. ex Stapf

Small erect herb with blue flowers. Bazarganga slope—Ralam valley, 4000 m, common, 39659.

5. *Delphinium cashmirianum* Royle

Medium sized erect herb with blue flowers. On way to Bazarganga Dhura 4500 m, common, 39660.

6. *D. vestitum* Wall. ex Roxb.

Medium sized erect herb with violet flowers growing on meadows. On way to Ralam glacier 4500 m, common, 39704.

7. *Ranunculus hirtellus* Royle

Tall erect herb with yellow flowers near moist places in *Betula-Rhododendron* forest. On way to Saba Odiyar 2800 m, common, 39758.

8. *Thalictrum foliolosum* DC.

Tall erect herb with fruits and white flowers in *Alnus-Rhododendron* forest. On way to Bui 1500 m, common, 39599.

MENISPERMACEAE

9. *Stephania glabra* (Roxb.) Miers

An extensive climber with fruits in *Alnus-Rhododendron* forest. On way to Bui 1500 m, common, 39587.

BEBERIDACEAE

10. *Berberis jaschkeana* Schneid.

Large shrub with red fruits, intermixed with *Rhododendron campanulatum*. Ralam valley 4000 m, common, 39749.

BRASSICACEAE

11. *Capsella bursa-pastoris* (L.) Medik.

Small erect herb with white flowers. On way to Ralam glacier 4200 m, common, 39712.

12. *Christolea himalayensis* (Camb.) Jafri

Small herb with thick root stock, flowers white with pinkish tinge, growing on glacial soil. Ralam glacier 4300 m, rare, 39684.

13. *Thlaspi arvense* L.

Herb with fruits growing as a weed of cultivated fields. Ralam 4000 m, common, 39723.

CARYOPHYLLACEAE

14. *Arenaria glanduligera* Edgew.

Small hairy herb with white flowers tinged with pink. On way to Bazarganga 4500 m, frequent, 39674.

15. *A. serpyllifolia* L.

Prostrate weak herb with fruits. On way to Ralam glacier 4500 m, common, 39719.

16. *Stellaria semivestita* Edgew. et Hook.f.

Prostrate herb with white flowers in *Alnus-Rhododendron* forest. On way to Bui 1500 m, rare 39592.

HYPERICACEAE

17. *Hypericum monanthemum* Hk.f. & Th. ex Dyer

Small erect herb with fruits on rocky habitats. Ralam valley 4000 m, rare, 39738.

GERANIACEAE

18. *Geranium pratense* L.

Large trailing herb with fruits and pink flowers, growing on meadows and rocky habitats. On way to Ralam glacier 4500 m, common, 39700.

BALSAMINACEAE

19. *Impatiens gigantea* Edgew.

Tall erect herb with pink flowers. Ralam 4000 m, common, 39745.

20. *I. scabrida* DC.

Tall erect hairy herb with yellow flowers, on way to Bui 2800 m, common, 39593.

VITACEAE

21. *Vitis Jacquemontii* Parker

An extensive climber, fruiting. On way to Bui 1500 m, common, 39582.

ANACARDIACEAE

22. *Rhus wallichii* Hook. f.

Small tree with green fruits. On way to Bui 2000 m, occasional, 39577.

FABACEAE

23. *Astragalus candolleanus* Royle ex Benth.

Small tufted woody herb on meadows and moraine, fruits hairy. On way to Ralam glacier 4500 m, common, 39699.

24. *Desmodium tiliacifolium* G. Don

Tall shrub in *Aesculus-Acer* forest. Fruiting. Saba Odiyar 2500 m, common, 39770.

25. *Guldenstaedtia himalaica* Baker

Small prostrate herb as undergrowth of *Rhododendron campanulatum*, on rocky habitats and on grassy slopes. Small hairy fruiting pods. On way to Bazarganga slope 4000 m, common, 39670.

26. *Indigofera habepetala* Bth. ex Baker

Tall shrub in *Acer-Aesculus* forest. Fruiting. Saba Odiyar 2500 m, common, 39766.

27. *I. heterantha* Wall. ex Brandis

Woody shrub in *Alnus-Rhododendron* forest with fruits and pink flowers. On way to Bui 1500 m, common, 39591.

28. *Parochaetus communis* Hamilton ex D. Don

Small erect herb on moist rocky habitats, flowers blue. On way to Bui 1500 m, common, 39580.

29. *Smithia ciliata* Royle

Small tufted herb along bridle path, on open places, flowers bluish white. Around Bui 1500 m, rare, 39583.

30. *Trigonella emodi* Benth.

Prostrate herb amidst rock boulders. On way to Ralam glacier 4000 m, common, 39714.

31. *Vigna capensis* Walp

Large climber upon *Xanthoxylum* sp. with rose pink flowers. On way to Bui 1800 m, rare, 39581.

CAESALPINIACEAE

32. *Cassia leschenaultiana* DC.

Tall erect herb with fruits and yellow flowers. On way to Bui 1500 m, rare, 39588.

ROSACEAE

33. *Cotoneaster* sp.

Tall erect shrub on rocky habitats with pink coloured fruits. On way to Tola 3200 m, common, 39651.

34. *Cotoneaster* sp.

Large prostrate shrub on rocks, fruits red. Ralam 4000 m, common, 39750.

35. *Cotoneaster* sp.

Tall erect shrub with dull pink coloured fruits on rocky habitats. On way to Tola 3200 m, common, 39653.

36. *Potentilla ambigua* Camb.

Small tufted herb with yellow flowers on glacial soil. Ralam glacier 4500 m, common, 39687.

37. *P. argyrophylla* Wall. ex Lehm.

Tall erect herb on moraines and open meadows, fruits. On way to Ralam glacier 4500 m, common, 39716.

38. *Rosa macrophylla* Lindl.

Tall erect prickly shrub with orange coloured, prickled fruits. On way to Tola 3200 m, common, 39654.

39. *R. sericea* Lindl.

Tall erect prickly shrub with red orbicular fruits. On way to Tola 3200 m, common, 39650.

40. *Sorbus aucuparia* L.

Tall erect shrub on meadow slopes, with fruits in association with *Rhododendron* sp. On way to Bazarganga Dhura 3800 m, 39652.

41. *S. cuspidata* (Spach) Hedlund

Big tree in *Betula-Rhododendron* forest, fruiting. On way to Saba Odiyar 2500-3000 m, occasional 39763.

SAXIFRAGACEAE

42. *Deutzia staminea* R. Brown ex Wallich

Large shrub in *Alnus-Rhododendron* forest, fruiting. On way to Bui 1500 m, occasional, 39585.

43. *Parnassia laxmanii* Pallas ex Schultes

Medium sized erect herb on meadow and rocky habitats, flowers white. Ralam valley 4000 m, common, 39736.

44. *Philadelphus tomentosus* Wall. ex Royle

Small shrub with fruits in *Acer-Aesculus* forest. Saba Odiyar 2500 m, common, 39768.

45. *Saxifraga fimbriata* Wall.

Small erect herb with yellow flowers amidst moss on rocky habitats. Ralam valley 4000 m, occasional, 39735.

46. *S. flagellaris* Willd.

Small flagellate erect herb, with yellow flowers. On way to Bui 1500 m, rare, 39579.

47. *S. diversifolia* Wall. var. *parnassifolia* (D. Don) Engl.

Small erect herb with yellow flowers on big boulders. Bui 1500 m, occasional, 39586.

CRASSULACEAE

48. *Sedum heterodontum* Hook.f. & Thoms.

Succulent herb with yellow flowers amidst boulders. Ralam 4000 m, occasional, 39721.

49. *S. hookeri* Balakr.

Small erect herb with red fruits on rocks and meadow. Ralam valley 4000 m, rare, 39741.

50. *S. trullipetalum* Hook.f. & Thoms.
Small prostrate fleshy herb with yellow flowers. Bazarganga 5000 m, common, 39679.

APIACEAE

51. *Bupleurum longicaule* Wall. ex DC.
Tall erect herb on meadow, fruiting. On way to Ralam Glacier 4500 m, common, 39683.
52. *Cortia depressa* (Don) Norman
Small herb with thick root stock flowers white. Bazarganga slope—Ralam valley 3750 m, common, 39751.
53. *Heracleum brunonis* Benth.
Medium sized erect herb as an undergrowth of *Rhododendron campanulatum* and on open meadows, flowers white. Bazarganga slope—Ralam valley 4000 m, common, 39669.

54. *Trachydium roylei* Lindl.
Small prostrate herb on moraine and meadow with blackish green fruits. On way to Bazarganga Dhura—Ralam valley 4000 m, common, 39667.

CORNACEAE

55. *Cornus macrophyllus* Wall.
Small tree in *Alnus-Rhododendron* forest, with fruits. On way to Bui 1500 m, rare, 39584.

RUBIACEAE

56. *Galium aparine* L.
Trailing herb with hispid fruits, growing as a weed of *Solanum tuberosum* and *Fagopyrum tataricum* cultivations. Ralam 4000 m, common, 39720.

ASTERACEAE

57. *Anaphalis contorta* Hook.f.
Small erect herb with white flowers, heads on rocky habitats and meadows. On way to Ralam glacier 4000 m, common, 39694.

58. *A. cuneifolia* Hook.f.
Erect herb, with white flower heads on rocky habitats and in glacial region. Ralam 4500 m, common, 39710.

59. *A. nepalensis* (Sprengel) Hand.-Maz.
Small erect herb with white flower heads. Bazarganga slopes 3800 m, common, 39657.

60. *Anaphalis* sp.
Medium sized erect herb with white flower heads. On way to Ralam 4200 m, common, 39715.

61. *Artemisia nilagirica* (CL.) Pamp.
Medium-tall, erect herb with dark brown-pink flower heads on rocks and meadows. On way to Ralam glacier 3000 m, common, 39697.

62. *A. stricta* Edgew.
Small erect herb on meadow with brownish green flower heads. Ralam valley 4000 m, common, 39728.

63. *Aster stracheyi* Hook. f.
Erect herb with runners, flower heads dark pink. On way to Tola, Ralam glacier 3000-4500 m, common, 39646 and 39707.

64. *Carduus onopordioides* Fish ex Bieb.
Tall erect prickly herb, on waste land with pink flower heads. Ralam 4000 m, common, 39729.

65. *Cicerbita cyanea* (D. Don) Beauverd
Tall erect herb in *Betula-Rhododendron* forest, fruiting. Saba Odiyar 3000 m, common, 39756.

66. *Dubyaea hispida* DC.
Medium sized erect, hispid herb with yellow flower heads on open grasslands and glacial region. On way to Ralam 4500 m, common, 39702.

67. *Erigeron multiradiatus* Benth.

Small-medium sized erect herb with pink violet flower heads on rocky habitats and open grasslands. Ralam 4000 m, common, 39725.

68. *Inula grandiflora* Willd.

Small hispid erect herb with yellow flower heads on moist rocky habitats. Ralam valley 4000 m, rare, 39739.

69. *Jurinea macrocephala* (DC.) Benth.

Robust herb with small pink flower heads on open meadows. On way to Ralam glacier 4500 m, 39698.

70. *Lactuca brunoniana* (Wall. ex DC.) Clarke

Tall erect herb with light pink flower heads in *Acer-Aesculus* forest. Saba Odiyar 2500 m, common, 39769.

71. *L. violaefolia* (Decne) Cl.

Tall erect herb with violet flower heads along bridle path. Ralam 4000 m, common, 39726.

72. *Leontopodium himalayanum* DC.

Medium sized erect woolly herb with fruiting achenes and flower heads on rocky habitats and meadows. Ralam 4000 m, common, 39688.

73. *Saussurea denticulata* Wall.

Erect shrub with pale white flower heads in *Acer-Aesculus* forest. Saba Odiyar 2500 m, common, 39767.

74. *S. graminifolia* Wall. ex Hook.f.

Small woolly herb with white woolly flower heads on moraine. Bazarganga slope—Ralam valley 4000 m, common, 39663.

75. *S. hypoleuca* Spreng ex DC.

Tall erect herb with pinkish flower heads on rocky habitats and meadows. On way to Ralam Glacier 4000 m, occasional, 39695.

76. *S. kuntheana* Cl.

Small tufted herb, with pink flower heads on moraines. Bazarganga slope—Ralam valley 4000 m, common, 39677.

77. *S. obvallata* (DC.) Clarke

Robust erect herb, with brown coloured flower heads on moraine. Bazarganga slope—Ralam valley 4000 m, common, 39752.

78. *S. taraxicifolia* Wall. ex DC.

Small tufted herb with pinkish sessile flower heads. Bazarganga slopes—Ralam valley 4000 m, common, 39678.

79. *Senecio chrysanthemoides* DC.

Tall erect herb with yellow flower heads on open meadows and moraine. On way to Ralam glacier 4500 m, common, 39706.

80. *S. graciliflorus* DC.

Tall erect herb in *Betula-Rhododendron* forest. Flower heads yellow. On way to Saba Odiyar 3000 m, common, 39757.

81. *S. kunthianus* Wall. ex DC.

Tall erect herb with yellow heads. Ralam 4500 m, common, 39708.

82. *S. ligularia* Hook.f.

Tall erect herb in *Betula-Rhododendron* forest. Flower heads yellow. On way to Saba Odiyar 3000 m, occasional, 39755.

83. *Taraxacum officinale* Weber

Herb on meadows with yellow flower heads. Bazarganga 4500 m, common, 39774.

CAMPANULACEAE

84. *Codonopsis ovata* Benth.

A trailing herb on meadows with green fruits. Ralam valley 4000 m, rare, 39740.

85. *Cynanthus linifolius* Wall. ex H.f. & Th.

Prostrate herb with blue flowers on rocks and meadows. On way to Ralam glacier 4000 m, common, 39701.

86. *C. lobatus* Wall. ex Benth.

Large trailing herb with blue flowers on meadows. Ralam valley 4000 m, common, 39746.

ERICACEAE

87. *Gaultheria trichophylla* Royle

Weak trailing herb with blue coloured fruits over moist rocks. Bazarganga slopes 4000 m, common, 39668.

88. *Rhododendron anthopogon* D. Don

Small stunted shrub on meadows intermixed with *Cassiope* sp. fruiting. Bazarganga 4000 m, common, 39775.

89. *R. campanulatum* D. Don

Large shrub with fruits. Bazarganga—Ralam valley 4000 m, common, 39676.

90. *R. lepidotum* Wall. ex Don

Small woody shrub on rocky habitat, fruits. On way to Saba Odiyar 3000 m, common, 39753.

PRIMULACEAE

91. *Androsace lanuginosa* Wall.

Small tufted herb with fruits on rocky habitat. On way to Saba Odiyar 4000 m, common, 39754.

OLEACEAE

92. *Syringa emodi* Wall. ex G. Don

Tall erect shrub in *Betula-Rhododendron* forest, fruiting. On way to Saba Odiyar 3000 m, common, 39764.

GENTIANACEAE

93. *Gentiana detonsa* Friest

Medium sized erect herb on meadows, fruiting. Ralam valley 4000 m, rare, 39743.

94. *G. pedunculata* Royle ex G. Don

Small erect herb with light blue flowers in moist habitats of meadows. On way to Ralam glacier 4000 m, common, 39691.

95. *G. stipitata* Edgew.

Small tufted herb with bluish green flowers. On way to Tola Ralam glacier 3000-4500 m, occasional, 39648, 39696.

96. *G. venusta* (Don) Griseb.

Small erect herb with blue flowers on meadows. Bazarganga slopes 3800 m, common, 39656.

97. *Swertia ciliata* (D. Don) B. L. Burt

Tall erect herb with white pink coloured flowers on meadows. Ralam glacier 4500 m, common, 39682.

98. *S. cuneata* Wall. ex D. Don

Tall erect herb with fruits and bluish white coloured flowers on meadows. On way to Bazarganga—Ralam valley 3800-4000 m, common, 39658, 39734.

BORAGINACEAE

99. *Cynoglossum glochidiatum* Wall. ex Bth.

Small herb with sky blue flowers on rocky habitats. On way to Bui 2000 m, common, 39578.

100. *Hackelia uncinata* (Royle ex Bth.) C. E. C. Fisher.

Tall erect herb with sky blue flowers in *Betula-Rhododendron* forest. On way to Saba Odiyar 2500 m, common, 39759.

101. *Macrotomia benthami* (G. Don) DC.

Tall erect herb in *Betula-Rhododendron* forest, fruiting. On way to Saba Odiyar 3000 m, common, 39761.

SCHOPHULARIACEAE

102. *Euphrasia densiflora* Pennell

Small erect herb with white flowers on meadows. On way to Ralam glacier 4000 m, common, 39681.

103. *Pedicularis brunoniana* Wall.

Small erect herb on meadows with pink flowers. Ralam 4000 m, common, 39686, 39705.

104. *P. hoffmeisteri* Klotz

Stout erect herb with fruits and yellow coloured flowers on meadows and moraine. On way to Ralam glacier 4000 m, common, 39717.

105. *P. mollis* Wall. ex Benth.

Small erect herb on meadows and moraine, fruiting. On way to Ralam glacier 4500 m, common, 39690.

106. *P. porrecta* Wall. ex Benth.

Small erect herb with red fruits on meadows. Bazarganga slope—Ralam valley 4000 m, common, 39664.

107. *P. rhinanthoides* Schrenk

Small erect herb with pink flowers on meadows. On way to Bazarganga, 4000 m, common, 39671.

108. *Picrorhiza kurreca* Royle ex Benth.

Small prostrate herb on moist rocks in moraine, fruiting. Bazarganga slope—Ralam valley 4000 m, common, 39662.

LENTIBULARIACEAE

109. *Utricularia kumaonense* Oliver

Minute herb with white flowers in moist habitat. Near Pilti bridge (Saba Odiyar) 3000 m, rare, 39773.

LAMIACEAE

110. *Elsholtzia ciliata* (Thunb.) Hyland

Small erect herb, with white flowers in *Alnus-Rhododendron* forest. On way to Bui 1500 m, rare, 39589.

111. *E. densa* Benth.

Herb as a common weed of *Solanum tuberosum* & *Fagopyrum tataricum* cultivation, flowers violet coloured. Ralam 4000 m, common, 39722.

112. *E. eriostachya* Benth.

Medium sized erect herb with greenish pink flowers on rocky habitats. Bazarganga slope 3800 m, common, 39661.

113. *Nepeta laevigata* (Don) Hand.-Maz.

Tall erect herb on open meadows and moraines with dark pink coloured flowers. On way to Ralam glacier 4500 m, common, 39709.

114. *Origanum vulgare* L.

Medium sized erect herb on meadows. Flowers pink. On way to Ralam glacier 4500 m, common, 39713.

115. *Phlonis bracteosa* Royle ex Benth.

Tall erect herb with fruits on meadows. Ralam 4000 m, common, 39727.

PLANTAGINACEAE

116. *Plantago himalaica* Pilger

Small erect herb on meadows, fruiting. Bazarganga slope 4000 m, common, 39666.

POLYGONACEAE

117. *Bistorta vacciniifolia* (Wall.) Greene

Large procumbent herb with pink flowers on rocky habitats. On way to Ralam glacier 4000 m, common, 39693.

118. *Persicaria nepalensis* (Meissn.) H. Gross

Tall erect herb on rocky habitats in *Quercus-Rhododendron* forest. Flowers greenish white. Ralam 4000 m, common, 39744.

119. *P. polystachya* (Wall. ex Meissn.) H. Gross

Tall erect herb along cultivated fields. Flowers white. Ralam 4000 m, common, 39724.

120. *Polygonum affine* D. Don

Trailing herb with pink flowers amidst boulders. On way to Bazarganga 4500 m, common, 39672.

121. *P. glaciale* Hook.f.

Small prostrate herb with white flowers on rocky habitats in shade. Ralam valley 4000 m, common, 39733.

122. *Rheum moorcroftianum* Royle

Rhizomatous herb on moist places, flowers red. Bazarganga slopes, 4000 m, rare, 39680.

123. *Rumex acetosa* L.

Tall erect herb on meadows and moraine, fruiting. On way to Ralam 4000 m, common, 39718.

124. *R. nepalensis* Spreng

Tall erect herb, fruiting. Ralam 4000 m, common, 39730.

CHLORANTHACEAE

125. *Circaester agrestis* Maxim

Small erect herb on moist places in rock crevices occasionally in association with

Leucanthus sp. fruiting. Shamboo Odiyar, 2500 m, abundant, 39633.

URTICACEAE

126. *Pilea racemosa* (Royle) Tuyama

Large herb with rose pink flowers. On way to Bui 3000 m, occasional, 38581.

SALICACEAE

127. *Salix lindleyana* Wall. ex Anders

Large prostrate shrub on rocky habitats and amidst boulders, fruits green. Bazarganga slope 4500 m, common, 39675.

MONOCOTYLEDONS

ORCHIDACEAE

128. *Goodyera fusca* Hook.f.

Terrestrial, erect fleshy herb amidst the clumps of *Rhododendron* sp. and *Gaultheria* sp. flowers greenish white. Bazarganga 4000 m, rare, 39665.

129. *Herminium monorchis* R. Br.

Terrestrial herb on meadows, fruiting, Ralam valley 4000 m, common, 39732.

130. *Orchis latifolia* L.

Terrestrial herb on moist places, fruiting. Ralam valley 4000 m, common, 39731.

ZINZIBERACEAE

131. *Globba racemosa* Smith

Tall erect herb in *Alnus-Rhododendron* forest, flowers yellow. On way to Bui 1500 m, common, 39590.

HAEMODORACEAE

132. *Aletris pauciflora* (Klotzsch) Hand.-Maz.

Small erect herb on meadows with brownish white flower. Bazarganga slope 3800 m, 39655.

LILIACEAE

133. *Allium stracheyi* Baker

Small erect herb, with light pink flowers. Ralam valley 4000 m, common, 39737.

134. *A. wallichii* Kunth.

Tall erect herb with pink flowers on meadows. On way to Ralam glacier 4500 m, occasional, 39685.

135. *Lilium giganteum* Wall.

Tall unbranched herb with hollow stem in *Acer-Aesculus* forest, fruiting. Near Lungrani 2500 m, common, 39771.

136. *Nomocharis nana* (Klotzsch) E. H. Wilson

Small erect herb on meadows, fruiting. Ralam valley 4000 m, rare, 39742.

JUNCACEAE

137. *Juncus himalensis* K. & G.

Tall erect herb with brown fruiting spikes. Ralam valley 4000 m, common, 39748.

CYPERACEAE

138. *Scirpus setaceus* L.

Small erect tufted herb on meadows with dark brown fruiting spikes. On way to Ralam 4500 m, common, 39703.

POACEAE

139. *Chrysopogon gryllus* (L.) Trin.

Tall erect herb with flowering spikes in *Alnus-Rhododendron* forest. On way to Bui 1500 m, common, 39595.

140. *Danthonia cachemyriana* Jaub. et Spach.

Tall erect grass with fruiting spikes on meadows. On way to Ralam glacier, on way

to Saba Odiyar 3000-4500 m, common, 39711, 39762.

141. *Deyeuxia* sp.

An erect grass with brown fruiting spikes on open slopes. On way to Ralam glacier 3200 m, common, 39692.

142. *Phleum alpinum* L.

Tall erect grass with dull violet spikes on moist rocks. Ralam valley 4000 m, common, 39747.

143. *Saccharum spontaneum* L.

Tall erect grass, with silvery white fruiting spikes along bridle path. On way to Bui 1500 m, common, 39594.

FERN S

PTERIDACEAE

144. *Pteris cretica* L.

Fern with sori amidst boulders. On way to Bui 1500 m, rare, 39596.

CRYPTOGRAMACEAE

145. *Cryptogramme crispa* R. Br.

Fern with sori on rocky habitat and shade. Bazarganga 4000 m, common, 39673.

ACKNOWLEDGEMENTS

We are greatly indebted to Dr. M. A. Rau, Retired Deputy Director, Botanical Survey of India, Northern Circle, Dehra Dun for his constant encouragement in studying the plants of Ralam valley and help in the preparation of this paper.